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Results of the Anaconda endovascular graft in abdominal aortic aneurysm with a severe angulated infrarenal neck

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Objective: **Proximal neck anatomy of an abdominal aortic aneurysm (AAA), especially a severe angulated neck of more than 60 degrees, predicts adverse outcome in endovascular aneurysm repair. In the present study, we evaluate the feasibility of the use of the Anaconda endovascular graft (Vascutec, Terumo, Inchinnan, Scotland) for treating infrarenal AAA with a severe angulated neck (>60 degrees) and report the midterm outcomes.**

Methods: **In total, nine Dutch hospitals participated in this prospective cohort study. From December 2005 to January 2011, a total of 36 AAA patients, 30 men and six women, were included. Mean and median follow-up were both 40 months.**

Results: **Mean infrarenal neck angulation was 82 degrees. Successful deployment was reached in 34 of 36 patients. Primary technical success was achieved in 30 of 36 patients (83%). There was no aneurysm-related death. Four-year primary clinical success was 69%. In the first year, eight clinical failures were reported including four leg occlusions which could be solved using standard procedures. After the first year, three patients with additional failures occurred; two of them were leg occlusions. Four patients needed conversion to open AAA exclusion. In six of 36 patients, one or more reinterventions were necessary. Three of them were performed for occlusion of one Anaconda leg and two were for occlusion of the body.**

Conclusions: **The use of the Anaconda endovascular graft in AAA with a severe angulated infrarenal neck is feasible but has its side effects. Most clinical failures occur in the first year. Thereafter, few problems occur, and midterm results are acceptable. Summarizing the present experiences, we conclude that open AAA repair is still a preferable option in patients with challenging aortic neck anatomy and fit for open surgery. (J Vasc Surg 2014;59:1495-501.)**

Since its introduction, endovascular aneurysm repair (EVAR) has gained widespread adoption as a routine treatment alternative for patients with abdominal aortic aneurysm (AAA). However, it has become clear that the failure of EVAR depends both on features of AAA anatomy and endovascular graft characteristics. The proximal AAA neck anatomy, especially a severe angulated neck of more than 60 degrees, predicts adverse outcome in EVAR.[1-5] However, this opinion has been challenged recently.[6]

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*A full list of MANSA study participants can be found in the Appendix (online only).

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Learning from the experience with first-generation endovascular grafts, and because of technological advances, the latest generations of commercially available endovascular grafts have been clearly improved. Modification and redesigning of the endovascular graft with specific attention to flexibility, proximal fit, and sealing intended to decrease the chance of type I endoleak and endovascular graft migration.[7-9] As a consequence, indications outside instructions for use (IFU) were sought in patients with hostile neck anatomy unfit for open repair.[10-16]

The Anaconda endovascular graft (Vascutec, Terumo, Inchinnan, Scotland) was designed with the intention of addressing some of the failure modes observed in the 1990s. Hypothetically, because of the zero body columnar strength design and the high flexibility of the system during placement, it should be feasible to utilize the Anaconda in AAAs with severe infrarenal angulations.[17]

In the present study we evaluated the feasibility and midterm outcomes of the Anaconda endovascular graft for treating infrarenal AAA with a severe angulated neck.

METHODS

In total, nine Dutch hospitals participated in this prospective cohort study. From December 2005 to January 2011, a total of 36 AAA patients, 30 men and six women, were included. Mean and median follow-up were both 40 months (range, 0-69 months).

Study design. Patients with an AAA and an infrarenal neck angulation of 60 degrees or more were eligible for inclusion in the Multicenter Angulated Neck Study with the Anaconda endovascular graft (MANSA). Table I presents an enumerative description of all the inclusion and exclusion criteria for the MANSA study. The study protocol was approved by the institutional review board. Aneurysm anatomy was defined through the use of Eurostar criteria.[18]

Each patient underwent a detailed preoperative screening to evaluate suitability for inclusion in the study. The information collected consisted of a general health analysis including the Society of Vascular Surgery/International Society of Cardiovascular Surgery (SVS-ISCVS) risk scores for diabetes mellitus, smoking, hypertension, hyperlipidemia, and cardiac, carotid, renal, and pulmonary disease, as well as American Society of Anesthesiologists (ASA) classification and ankle-brachial index. Preoperative AAA assessment included detailed spiral computed tomography (CT) scanning and angiography as described in a previous study with the Anaconda endovascular graft (ANA-004 study).[19]

Study hypothesis and definitions. The primary objectives of the MANSA study were to examine the technical and clinical success of the Anaconda endovascular graft for the treatment of AAA with a severe angulated infrarenal neck. The outcome parameters were outlined in detail in ANA-004 and were in line with the previous published guidelines for reports concerning EVAR by Chaikof et al.[20]

Clinical success is reported as short-term clinical success (30 days) and midterm clinical success (up to 4 years of follow-up).

Device description. The Anaconda AAA Stent Graft System is a three-piece endovascular graft. The stents were made of multiple-element nitinol stents internally covered with woven polyester graft material. The top of the endovascular graft consists of a dual-ring stent design, resembling the Anaconda snake. The proximal ring stent is anchored in an infrarenal position by four pairs of nitinol hooks, which prevent device migration. The body is unstented, resulting in zero column strength and adaptability in angulated proximal vascular anatomy. The iliac legs are fully supported with independent nitinol ring stents, which prevent kinking and provide flexibility with fixation in tortuous distal iliac and femoral anatomy. The delivery device of the main body has an outer diameter of 20.4F or 22.5F (6.8-7.5 mm), depending of the stent graft neck diameter used. The delivery system for the iliac legs has an outer diameter of 18.3F (6.1 mm). The Anaconda AAA Stent Graft System can be fully repositioned by use of the control collar of the delivery system handle. The cannulation of the contralateral gate of the body is facilitated with a magnet system that uses a preloaded magnet wire to assist in the cannulation and deployment of the contralateral iliac leg.

Operative procedure. All surgery was performed electively with a radiolucent table under fluoroscopic guidance. The endovascular graft was selected according to AAA anatomy, with special attention for at least 20%-30% oversizing of the prosthetic body in relation to the infrarenal neck diameter. The procedure was carried out under local (n = 9), epidural (n = 26), or general (n = 1) anesthesia, by means of standard surgical exposure of femoral arteries with the use of surgical cut-down and arteriotomy. For anticoagulation during the procedure, intravenous heparin (100 IU/kg body weight) was given in accordance with standard endovascular procedures. A second heparin dose was given when the EVAR procedure exceeded 2 hours of operative time.

First, on both sides, a stiff .035 wire (Backup Meier; Boston Scientific, Natick, Mass) was introduced up to the aortic arch. When iliac and aortic angulations could not be straightened with the use of stiff wires, one or two endovascular sheaths (Cook Medical Europe Ltd, Limerick, Ireland) were used. The zero columnar strength of the body caused by the unstented segment is problematic in the severely angulated distal part of the infrarenal aortic neck. To prevent infolding of the body, the starting point of the release of the iliac legs in the body was therefore close to the proximal body stent rings at a distance above the level of the aortic rim and angulation. In this way, the body is supported in this crucial place and kinking or infolding was diminished.

If applicable, the legs were extended to the common iliac bifurcation. All necessary operative details, overall outcome of the procedure, as well as any adverse event during operation were recorded.

Follow-up protocol. The study included postoperative follow-up at discharge and at 3, 6, 12, 18, and 24 months and yearly thereafter to assess clinical success or failure. Each patient underwent postoperative CT scanning

Table I. Inclusion and exclusion criteria

Inclusion criteria
Patient willing and available to comply with follow-up requirements
Patient can comply with instructions and gives informed consent
Life expectancy >2 years
AAA >50 mm in diameter
Symptomatic small AAA
Infrarenal proximal neck diameter 18-31.5 mm
Infrarenal proximal neck length ≥15 mm
Infrarenal aortic angulation >60°
Distal iliac fixation site diameter <16 mm and >30 mm in length
Access vessels >7.5 mm in diameter
Exclusion criteria
Ruptured or symptomatic AAA
Juxtarenal or suprarenal extension of aneurysm
Low operative risk for open repair
Presence of serious concomitant medical disease or infection
Known allergy to contrast medium, nitinol, or polyester
Inability to preserve at least one hypogastric artery
Connective tissue disease
ASA grade IV or V
Need for surgical reconstruction of other visceral arteries
Presence of >50% continuous calcification of proximal neck
Presence of >50% thrombus in proximal neck

AAA, Abdominal aortic aneurysm; *ASA,* American Society of Anesthesiologists.

Table II. Patient characteristics

Demographic	*Number of patients*
Mean age (range), years	74 (61-84)
Sex	
Male	30
Female	6
ASA grade	
I	1
II	29
III	6
Unknown	0
Diabetics	
Normal	19
Only diet-controlled	6
Diet + drugs	11
Smoking	
Not in past 10 years	22
Ex-smoker	6
Smoker	8
Hypertension	
None	18
1-2 Drugs	14
3+/Uncontrolled	4
Hyperlipidemia	
Normal	19
Mild	6
Diet + drugs	11
Cardiac disease	
Normal	18
Asymptomatic, MI	7
Angina, etc	11
Carotid disease	
No disease	29
Asymptomatic	1
Transient stroke	6
Completed stroke	0
Renal disease	
Normal	32
Increased creatinine	4
Pulmonary disease	
Normal	28
Mild	3
Moderate	4
Severe	1

AAA, Abdominal aortic aneurysm; *ASA,* American Society of Anesthesiologists; *MI,* myocardial infarction.

at discharge and duplex ultrasound or CT and biplane abdominal radiography thereafter.

Recorded follow-up data included overall survival; death as a result of aneurysm-related treatment; conversion to open repair; endoleak; reintervention; aneurysm expansion or rupture; renal artery occlusion; and endovascular graft infection, thrombosis, migration, dilatation, or failure of integrity of exoskeleton structure.

Statistical analysis. Only descriptive statistics were performed, and mean, median, or range are reported when appropriate.

RESULTS

Patient and anatomical characteristics

Patient characteristics are summarized in Table II and anatomical characteristics in Table III. Mean infrarenal neck angulation in this cohort of AAA patients was 82 degrees (range, 60-133 degrees). Mean aneurysm diameter was 71 mm, ranging from 45 mm (symptomatic small AAA) to 100 mm. In Table IV, the outcome parameters up to 4 years of follow-up are listed.

Table III. Eurostar type of abdominal aortic aneurysm (*AAA*) morphology

Anatomical criteria	*No.*	*Range (median)*
Total number of patients	36	-
Eurostar type of AAA		
A	9	-
B	23	-
C	1	-
D	3	-
E	0	-
Etiology		
Atherosclerosis	36	-
Other	0	-
Shape aneurysm		
Fusiform	35	-
Sacculair	1	-
Other	0	-
Diameter infrarenal neck		
D2a, mm	23	16-31
D2b, mm	23	17-29
D2c, mm	23	17-31
Neck shape (Balm)[4]		
= ||	24	-
=/\	4	-
=\/	3	-
= <>	2	-
= ><	3	-
Length, mm	28	10-45 (30)
Circumferential thrombus		
% D2 a-b-c	Max	80-20-20
Circumferential calcification		
% D2 a-b-c	Max	10-20-30
Angulation aortic neck, AAA, degrees	82	60-133 (80)
Aneurysm diameter		
D3, mm	71	45-100 (68)
Diameter right common iliac artery		
Proximal, mm	14	
Mid, mm	15	9-19
Distal, mm	14	
Angulation, degrees	51	0-150
Diameter left common iliac artery		
Proximal, mm	15	
Mid, mm	14	9-63
Distal, mm	15	
Angulation, degrees	41	0-180
Diameter right external iliac artery, mm	10	8-14
Angulation, degrees	48	0-150
Diameter left external iliac artery, mm	10	9-14
Angulation, degrees	48	0-180

Technical success

Primary technical success was achieved in 30 of 36 patients (83%). There were two serious adverse events (SAEs) during the initial EVAR procedure. In one patient, an improper released Anaconda body below the aortic neck angulation could not be repositioned upstream

Table IV. Clinical success

	30 days	*1st year*	*2nd year*	*3th year*	*4th year*	*Total*[b]
Number in cohort	36	36	35	31	27	36
Lost to follow-up			2			6% (2/36)
All-cause mortality	0% (0/36)	3% (1/36)	6% (2/35)	0% (0/31)	19% (5/27)	22% (8/36)
Aneurysm-related death	0% (0/36)	0% (0/36)	0% (0/35)	0% (0/31)	0% (0/27)	0%
Primary clinical success	89% (32/36)	78% (28/36)	74% (26/35)	71% (22/31)	77% (21/27)	69% (25/36)
Primary assisted and secondary clinical success	94% (34/36)	83% (30/36)	80% (28/35)	77% (24/31)	81% (23/27)	75% (27/36)
Clinical failure[a]	11% (4/36)	11% (4/36)	3% (1/35)	3% (1/31)	4% (1/27)	31% (11/36)
SAEs	11% (4/36)	8% (3/36)	3% (1/35)	3% (1/31)	4% (1/27)	27% (10/36)
Conversion	2	1	1			11% (4/36)
Limb occlusion	1	2	1	3	0	14% (5/36)
Freedom from re-intervention		89% (32/36)	83% (29/35)	80% (25/31)		83% (30/36)
Freedom from migration[b]		100% (36/36)	100% (35/35)	97% (30/31)	97% (26/27)	94% (34/36)

SAEs, Serious adverse events.
[a]Excluded: Death not aneurysm-related. Included primary assisted and secondary clinical success (two patients).
[b]Intention to treat.

because of the aortic rim at the level of the angulation, and conversion to open repair was necessary.

In another patient, deployment of the contralateral Anaconda leg failed. In the already-deployed Anaconda main body, an aortouni-iliac endovascular graft (Talent; Medtronic, Minneapolis, Minn) with additional femoral-femoral crossover bypass was placed. This patient died of metastatic colonic malignancy in the fourth year of follow-up and developed in his last week a possible paraneoplastic occlusion of the Anaconda stent just distal from the renal arteries, which may have contributed to the death of this patient.

There were four type I endoleaks at the end of the implantation. Because of the adaptability of the two saddle-shaped proximal stent rings, conservative treatment was initiated. Three of these four type I endoleaks resolved, with no signs of endoleak on the postoperative CT scan at discharge. The fourth patient with type I endoleak was initially treated with a proximal aortic extension cuff (Talent), and selective embolization of the type I endoleak. CT scanning on the fifth postoperative day demonstrated persisting type I endoleak and occlusion of the left renal artery. This artery was unintentionally partially covered by the aortic extension cuff. A partial conversion suturing the Anaconda body onto the native aorta was done. In the third-year follow-up, a type II endoleak was discovered and treated with coiling because of slight growth of the AAA. Unfortunately, after 49 months of follow-up, a contained AAA rupture caused by proximal anastomotic suture dislodging occurred. Resuturing of the proximal Anaconda body was performed successfully.

Thirty-day clinical success

During the first 30 days, the all-cause mortality rate was 0% (Table IV). Mean and median hospital stays were 8 and 6 days (range, 3-30 days), respectively. A total of 13 patients were hospitalized between 3 and 5 days. One patient was re-admitted after 30 days, mainly because of respiratory problems. There were 11 type II endoleaks at discharge CT. The 30-day primary clinical success was 89% and assisted primary and secondary clinical success 94%. There were four 30-day clinical failures and SAEs (11%).

One-year clinical success

The first-year primary clinical success rate was 28/36 (78%). The primary assisted and secondary clinical success rates were 30/36 (83%). There were four additional clinical failures after 30 days, including two occlusions of the main body and two leg occlusions. In three of these four patients, additional interventions were necessary (femoral-femoral crossover bypass, recanalization of the stent body, conversion to an open bifurcated prosthesis). The fourth patient remained asymptomatic, and a conservative policy was followed. One patient died during the first year because of advanced age with general exhaustion.

Midterm clinical success

After 4 years, two patients were lost to follow-up. At 4 years, the aneurysm-related mortality rate was zero. All-cause mortality rate was 8/36 (22 %). The 4-year primary clinical success rate was 25/36 (69 %). The primary assisted and secondary clinical success rates were both 27/36 patients (75%). Eight of 11 clinical failures and seven of 10 SAEs occurred in the first postoperative year.

Other clinical failures, reinterventions, and SAEs

Occlusion of the Anaconda body. One patient perceived a complete occlusion of the Anaconda body 1 week after a herniated nucleus pulposus operation. We speculated that during the operation in which the patient was resting on his belly and positioned with 90 degree hip flexion, the Anaconda endovascular graft was inadvertently compressed. Complete conversion and implantation of a conventional Dacron aortobi-iliac prosthesis was performed.

In one patient, an occlusion of the Anaconda body occurred 11 months after the implantation. Percutaneous

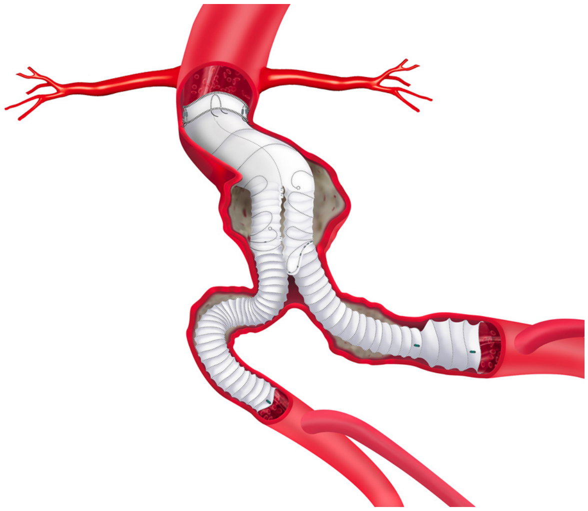

Fig. The Anaconda One-Lok endovascular graft (Vascutec, Terumo, Inchinnan, Scotland), introduced in 2011, is a modification of the Anaconda used in this study. Compared with the Anaconda used in this study, the One-Lok has two additional midrings in the region of the body and a universal diameter limb docking zone.

recanalization of the body was established by insertion of two self-expandable stents at the level of the flow splitter. Four months later, this patient presented with a contained AAA rupture. A complete conversion with insertion of a conventional Dacron aortobi-iliac prostheses was carried out.

Occlusion of an Anaconda leg. One patient had a symptomatic occlusion of the left Anaconda leg 1 month after operation. Thrombectomy was performed, but reocclusion occurred within 3 months. A femoral-femoral crossover bypass resolved the clinical symptoms, and a type II endoleak was coiled. One patient had a symptomatic occlusion of the left Anaconda leg. A femoral-femoral crossover bypass was done. One patient had a symptomatic occlusion of the right leg. In this patient, thrombectomy and percutaneous transluminal angioplasty of the common and external iliac artery were successful.

One patient had an asymptomatic occlusion of the left Anaconda leg that was treated conservatively. Finally, another patient had an occlusion of the left leg, a stenotic right leg, and migration of the stent with rotation but was asymptomatic and treated conservatively.

Migration. One patient had migration of the Anaconda body as the result of neck dilation, producing a type I endoleak. Conservative treatment but also revision with the use of a triple fenestrated Anaconda extension are considered.

DISCUSSION

The present study, with a mean follow-up of 40 months, demonstrated that EVAR in patients with hostile neck anatomy outside Anaconda IFU criteria provided acceptable primary and secondary results without aneurysm-related mortality. The features of the second-generation Anaconda endovascular graft, such as repositionability of the two proximal stent rings during deployment and the unsupported and therefore more flexible main body, appear to expand the applicability of EVAR in AAA beyond 60 degrees of neck angulation.

Table V. Suitability for endovascular aneurysm repair (EVAR) according to instructions for use (IFU)

Type	*Infrarenal angulation and neck length*
Anaconda[a]	≤60° and ≥15 mm
Zenith[b]	<60°and ≥15 mm with suprarenal angulation of <45°
Excluder[c]	≤60° and ≥15 mm
Talent[d]	≤60° and ≥10 mm
Endurant[d]	<60°and ≥15 mm with suprarenal angulation of ≤45
	≤75° and ≥15 mm with suprarenal angulation of ≤60°
Aorfix[e]	≤90° and ≥15 mm
AFX[f]	≤60° and ≥15 mm
Powerlink[f]	≤60° and ≥15 mm

[a]Vascutec, Terumo, Inchinnan, Scotland.
[b]Cook Medical Europe Ltd, Limerick, Ireland.
[c]W. L. Gore and Associates, Newark, NJ.
[d]Medtronic, Minneapolis, Minn.
[e]Lombard Medical Technologies, Didcot, UK.
[f]Endologix, Irvine, Calif.

The number of leg occlusions was five out of 36 (14%) in total, and three of them occurred in the first year after implantation. As mentioned in the ANA-004 study, leg occlusion in the Anaconda endovascular graft was mainly observed in patients with small body diameter (<25 mm) and relatively large-diameter legs. The combination with steep neck angulations exacerbated the possibility of leg occlusions and could have propagated ultimately to body occlusion. On the basis of these observations, the sizing and reference chart of the Anaconda endovascular graft concerning the body leg combination was adjusted. A second modification to further reduce leg occlusion was the introduction of the Anaconda One-Lok system in 2011 (Fig); every leg fits in every body, abolishing body and leg mismatch. The One-Lok system was introduced after closure of the current study, and clinical results of the One-Lok system in AAA with severe angulated necks are not available yet.

Carpenter et al[21] mentioned in their study several causes of leg occlusion. Direct extrinsic compression of the limb in the iliac trajectory caused by vessel stenosis or tortuosity could provide a friction point for the introduction of twists. As a result of this, occlusion can occur. Also, a severe calcified and relatively narrow aortic bifurcation can become a fulcrum for the graft to bend or twist. Extrinsic limb compression caused by luminal thrombus within the aneurysm can compromise the limb outflow.

With only one case of a migrated Anaconda body caused by neck dilation, the migration rate appears to be low. The mechanical characteristics of the Anaconda saddle-shaped proximal fixation and sealing rings including four hooks were clearly demonstrated in an experimental in vitro set-up comparing displacement forces (DFs) at proximal neck seal lengths of 15 and 10 mm in three different types of stents.[22] The Anaconda endovascular graft produced the second-highest DF in the neck and the highest DF in the distal fixation zone; distally, the "fish-mouth" configuration also increased the friction of the vessel wall.[23] The high DF migration of an appropriately oversized Anaconda endovascular graft is rare, even in very challenging environments such as highly angulated necks. Latest-generation endovascular graft IFU include a neck angle varying between 60 degrees or less, with a minimum of 10-15 mm neck length, 75 degrees or less with the use of the Endurant, or 90 degrees or less with the use of the Aorfix, according to IFU. The IFU of the two endovascular grafts, including highly angulated infrarenal aortic necks, were not supported with midterm clinical data strictly applying the Chaikof criteria. Table V summarizes the IFU for EVAR indications for CE-approved stent prostheses.

Applying the Anaconda device in severe angulated necks outside the IFU challenged the participating EVAR teams in more than one way. In the present study, the operative procedures were custom-made in nearly every individual case.

Because of inclined (ie, nonperpendicular to the flow lumen) placement of the proximal stent rings in the severely angulated neck, significant mean oversizing (30%) of the body was applied.

In this multicenter study, the participating hospitals were acknowledged EVAR experts. The patients were treated in their own regional hospital. They were visited by the proctors of the coordinating Anaconda study hospital (Medical Spectrum Twente, Enschede) during the specific EVAR procedure in the MANSA study protocol. In this way, the local EVAR teams could be introduced to the Anaconda endovascular graft in difficult cases, expanding the indication for treatment. Introducing the Anaconda in different hospital settings could have implications for these study results. The four clinical failures in 30 days occurred in four different participating centers, including the center with the leading number of MANSA patients. Two of the clinical failures were technical failures during operation and were reported at the beginning of the study in each particular hospital and reflect the difficulties in the use of the Anaconda stent in hostile neck anatomy.

A weakness of this study is the small inclusion of patients in most of the participating centers. There was no true learning curve with the use of the Anaconda in severely angulated aneurysms, although an experienced proctor was always available during the procedure.

More than a decade of experiences with the Anaconda endovascular graft indicated that only in reversed conical and bell shaped necks it is challenging to obtain proper sealing and fixation of the Anaconda body. In line with Chauhuri, we disapprove the use a (standard) endovascular graft outside the IFU in very short segmented necks ($\leq$5 mm).[24] Complications such as type I endoleak, neck dilatation, and endovascular graft migration were seen in angulated neck studies and represent the challenges of EVAR in these circumstances.[25,26] We anticipate that such an EVAR procedure must be primarily executed in high-volume centers. In this study, all participating centers were experienced in EVAR.

Long-term follow-up is thereby necessary because in general, reinterventions after the first year were still necessary in a significant part of this population.[7-9]

CONCLUSIONS

Summarizing the present experiences, we conclude that open AAA repair is still a preferable option in patients with challenging aortic neck anatomy and who are fit for open surgery.

We thank all participating physicians and hospitals for including patients in this MANSA study. We are also grateful to Anja Stam, clinical research officer, for her help in gathering the relevant patient data.

AUTHOR CONTRIBUTIONS

Conception and design: RG
Analysis and interpretation: SR, CZ, RG
Data collection: SR, AH, RG
Writing the article: SR, CZ, RG
Critical revision of the article: CZ, AH, RG
Final approval of the article: SR, CZ, AH, RG
Statistical analysis: SR
Obtained funding: Not applicable
Overall responsibility: RG

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APPENDIX (online only). Full list of Multicenter Angulated Neck Study with the Anaconda endovascular graft (MANSA) study participants

Hospital	*Physician*	*Number of patients*
Medical Spectrum Twente, Enschede, The Netherlands	R.H. Geelkerken, MD, PhD	25
Antonius Hospital Nieuwegein, The Netherlands	J.P. de Vries, MD, PhD	2
Leiden University Medical Centre, The Netherlands	Prof. J.J. Hamming, MD, PhD	2
Ikazia Hospital, Rotterdam, The Netherlands	P.T. den Hoedt, MD, PhD	2
St Jansdal Hospital, Harderwijk, The Netherlands	W.L. Akkersdijk, MD, PhD	1
Rijnland Hospital, Leiderdorp, The Netherlands	P.P.A. Hedeman Joosten, MD, PhD	1
Gelre Hospital, Apeldoorn, The Netherlands	H.C.J.L. Busscher, MD, PhD	1
Erasmus Hospital, Rotterdam, The Netherlands	Prof. H.J.M. Verhagen, MD, PhD	1
TerGooi Hospital, Hilversum, The Netherlands	E.J.F. Hollander, MD, PhD	1
Total number		36